

REMARKS

Applicants thank the Examiner for the courtesy extended to Applicants' attorney during the interview held March 7, 2006, in the above-identified application. During the interview, Applicants' attorney explained the presently-claimed invention and why it is patentable over the applied prior art. The discussion is summarized and expanded upon below.

The rejection of Claims 1, 4, and 29-33 under 35 U.S.C. § 103(a) as unpatentable over U.S. 4,585,804 (Lancaster et al) alone, or in view of U.S. 4,742,089 (Naka et al), is respectfully traversed.

The active claims are drawn to a catalyst comprising the combination of two amines, viz., (1) at least one trialkyl monoamine selected from the group consisting of dimethylethylamine, dimethylpropylamine, dimethylbutylamine, dimethylpentylamine, dimethylhexylamine, dimethylheptylamine, dimethyloctylamine, dimethylnonylamine, dimethyldecylamine, dimethylundecylamine, dimethyldodecylamine, dimethyltridecylamine, dimethyltetradecylamine, dimethylpentadecylamine and dimethylhexadecylamine, and (2) at least one amine compound selected from the group consisting of triethylenediamine, N,N,N',N'-tetramethyl-1,6-hexanediamine and N,N-dimethylcyclohexylamine. The catalyst is recited in independent Claim 1 as "for producing a rigid polyurethane foam by means of at least one blowing agent selected from the group consisting of 1,1,1,3,3-pentafluoropropane (HFC-245fa), 1,1,1,3,3-pentafluorobutane (HFC-365mfc) and a low boiling point hydrocarbon." In addition, Claim 1 now requires that the at least one amine compound (1) and the at least one amine compound (2) be present in amounts effective to improve at least one property of a rigid polyurethane foam produced by means of at least one of the above blowing agents and the catalyst, compared to an otherwise identical rigid polyurethane foam produced using said at least one amine compound (1) alone, or said at least one amine

compound (2) alone, as the catalyst, and wherein said at least one property includes dimensional stability. New Claim 38 is analogous, but references a balance of the properties flowability, adhesive strength and dimensional stability.

The above-discussed amendment to Claim 1 reflects Applicants' discovery that the above-discussed combination of amines produces a polyurethane foam that is superior to one using either amine component alone as a catalyst when used in conjunction with a blowing agent selected from the group consisting of HFC-245fa, HFC-365mfc, and a low boiling point hydrocarbon.

Two sets of comparative data in the specification evidence this superiority. This comparative data has been discussed in prior responses, and Applicants submit that this data is still relevant. The discussion of the data and the arguments made with respect thereto appear in the Appendix to this amendment.

As described in the specification beginning at page 9, line 25, blowing agents of the type recited in the present claims are hardly soluble in a polyol as compared to HCFC analogs, are expensive, and if various tertiary amine catalysts are used, the amount of water to be used will be substantial, whereby there will be a problem that, compared to rigid polyurethane foams obtained using conventional HCFC or the like as a blowing agent, the foam will be inferior in flowability, adhesive strength and dimensional stability. Thus, the presently-claimed invention is particularly efficacious when used to make rigid polyurethane foams using at least one of the blowing agents recited in the present claims.

Lancaster et al discloses "improved" rigid polyurethane foams produced in the presence of, *inter alia*, a blowing agent and at least one catalyst, wherein the improvement comprises incorporating a compound having at least one primary aliphatic amine group of a particular average molecular weight range (column 1, lines 35-56). Applicable catalysts listed include, *inter alia*, triethylene diamine and dimethylethylamine (paragraph bridging

columns 3 and 4). While Lancaster et al discloses that mixtures of catalysts can be used, no advantage is disclosed from doing so.

Naka et al is drawn to the production of rigid polyurethane foams by reacting a polyol component having a special composition with an isocyanate component in the presence of a blowing agent, a reaction catalyst and a foam stabilizer having particular properties (Abstract). The Examiner relies on Naka et al's listing of triethylene diamine, as well as dimethylcyclohexylamine and tetramethylhexamethylene diamine, finding them to be "equivalent." Note, however, that among the blowing agents listed in Naka et al (column 4, lines 24-34), none are within the terms of the present claims.

The Examiner holds that it would have been obvious both to use the triethylene diamine and dimethylethylamine of Lancaster et al in combination, and to substitute the triethylene diamine with the "equivalent" dimethylcyclohexylamine or tetramethylhexamethylene diamine of Naka et al in that combination.

In reply, Naka et al does not disclose triethylene diamine, dimethylcyclohexylamine and tetramethylhexamethylene diamine, as necessarily "equivalent." Rather, they are each listed simply as applicable in Naka et al's reaction catalyst. More significantly, and as Applicants' attorney noted during the above-referenced interview, the applied prior art recognizes no benefit in using various catalysts in combination, compared to the use of individual catalysts alone. Thus, Claim 1 and claims dependent thereon, and Claim 38, are necessarily patentable, since they are inclusive only of catalysts which provide a rigid polyurethane foam having at least improved dimensional stability (Claim 1) or an improved balance of flowability, adhesive strength and dimensional stability (Claim 38), compared to the use at least one compound (1) alone, or at least one compound (2) alone. It should not be necessary for Applicants to actually **show** superiority for all such compositions, since the

prior art, as discussed above, recognizes no benefit from any combination of the above amines.

Claims 34-37 are separately patentable, since none of the applied prior art discloses any of the members of the at least one amine compound (1) Markush group. However, even if the prior art did disclose members of the amine compound (1) Markush group of Claims 35 and 37 as applicable catalysts individually for rigid polyurethane foams, Applicants submit that the above-discussed comparative data of record is commensurate in scope with these claims, even though the data for the claimed combinations do not cover the entire range of relative amounts of each amine component covered by the claims, contrary to the suggestion made by the Examiner during the above-referenced interview. Since **no** combinations of the presently-recited at least one amine compound (1) and at least one amine compound (2) are explicitly disclosed in the prior art, a comparison with one combination within the terms of the present claims, to each member of the combination alone, as in the present comparative data, should be sufficient.

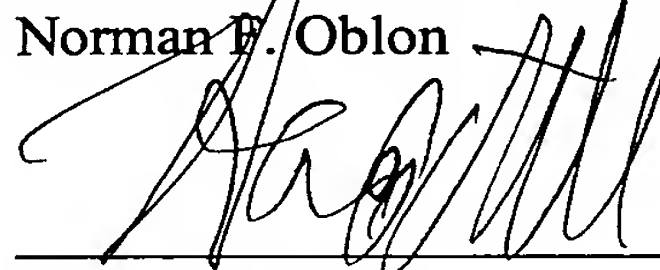
In sum, neither the presently-claimed invention, nor the above-discussed superior results, are disclosed or suggested by the applied prior art.

For all the above reasons, it is respectfully requested that the rejection be withdrawn.

All of the presently active claims in this application are now believed to be in immediate condition for allowance. The Examiner is respectfully requested to rejoin non-elected method claims of equal scope, and in the absence of further grounds of rejection, pass this application to issue with all active and rejoined claims.

Respectfully submitted,

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### APPENDIX

In the first set of comparative data, which demonstrates the significance of using HFC-245fa or HFC-365mfc as the blowing agent, Examples 1-24 are according to the presently-claimed invention, and Comparative Examples 1-29 are not. The only difference between Comparative Examples 1-14 and the Examples is the catalyst used. Comparative Examples 15-26 employ the amine combination of the present invention, but with HCFC-141b as the blowing agent, i.e., a blowing agent other than HFC-245fa, HFC-365mfc, and a low boiling point hydrocarbon.

The data are shown in Tables 2, 4 and 6, at pages 58-59, 62, and 67, respectively. As described at page 68, lines 14-16, in each Example, a rigid urethane foam excellent in flowability, adhesive strength and dimensional stability, was obtained. For Comparative Examples 1-4 and 8-11, which used only amine (1) as the catalyst, large amounts of the catalyst were required, and the foams were inferior in flowability and dimensional stability, as described at page 68, lines 17-23. For Comparative Examples 5-7 and 12-14, which used only amine (2) as the catalyst, the foams were inferior in flowability, adhesive strength and dimensional stability, as described at the paragraph bridging pages 68 and 69. For Comparative Examples 15-26, using the amine combination of the present claims but with a different blowing agent caused little change in flowability, adhesive strength or dimensional stability of the foams.

The second set of comparative data is analogous to the above-discussed first set, but highlights the significance of using a low boiling point hydrocarbon as an applicable blowing agent. See Tables 8, 10 and 12, and the descriptions of Examples 25-48, and Comparative Examples 30-58, in the specification at page 81, lines 1-26.

The comparative data is set forth in greater detail below. In the Tables, as can be confirmed by, for example, Table 1 at page 57 of the specification, Catalyst A is

dimethylbutylamine; Catalyst B is dimethylhexylamine; Catalyst C is dimethyloctylamine; Catalyst D is dimethyldodecylamine; Catalyst E is triethylenediamine; Catalyst F is N,N,N',N'-tetramethyl-1,6-hexanediamine; and Catalyst G is N,N-dimethylcyclohexylamine.

When HFC-245fa was used as a blowing agent:

Catalyst	Data	Flowability (cm)	Adhesive strength (kgf/cm <sup>2</sup> )	Dimensional stability (%)
Combination of Catalyst A and at least one of Catalysts E to G (Present Inv.)	Examples 1 to 3	81 to 82	1.17 to 1.20	-1.3 to -1.0
Catalyst A alone	Comparative Example 1	76	1.38	-8.8
Catalyst E alone	Comparative Example 5	72	0.45	-3.5
Catalyst F alone	Comparative Example 6	76	0.51	-5.2
Catalyst G alone	Comparative Example 7	76	0.48	-5.6

Catalyst	Data	Flowability (cm)	Adhesive strength (kgf/cm <sup>2</sup> )	Dimensional stability (%)
Combination of Catalyst B and at least one of Catalysts E to G (Present Inv.)	Examples 4 to 6	79 to 81	1.32 to 1.45	-1.2 to -0.7
Catalyst B alone	Comparative Example 2	77	1.56	-9.2
Catalyst E alone	Comparative Example 5	72	0.45	-3.5
Catalyst F alone	Comparative Example 6	76	0.51	-5.2
Catalyst G alone	Comparative Example 7	76	0.48	-5.6



Catalyst	Data	Flowability (cm)	Adhesive strength (kgf/cm <sup>2</sup> )	Dimensional stability (%)
Combination of Catalyst C and at least one of Catalysts E to G (Present Inv.)	Examples 7 to 9	79 to 83	1.21 to 1.33	-1.2 to -0.8
Catalyst C alone	Comparative Example 3	75	1.5	-8.5
Catalyst E alone	Comparative Example 5	72	0.45	-3.5
Catalyst F alone	Comparative Example 6	76	0.51	-5.2
Catalyst G alone	Comparative Example 7	76	0.48	-5.6

Catalyst	Data	Flowability (cm)	Adhesive strength (kgf/cm <sup>2</sup> )	Dimensional stability (%)
Combination of Catalyst D and at least one of Catalysts E to G (Present Inv.)	Examples 10 to 12	79 to 83	1.14 to 1.28	-1.5 to -0.9
Catalyst D alone	Comparative Example 4	76	1.41	-7.7
Catalyst E alone	Comparative Example 5	72	0.45	-3.5
Catalyst F alone	Comparative Example 6	76	0.51	-5.2
Catalyst G alone	Comparative Example 7	76	0.48	-5.6

As is evident from the above tables, where HFC-245fa was used as a blowing agent, when Catalyst A, B, C or D was used alone, the dimensional stability was reduced substantially. Further, when Catalyst E, F or G was used alone, the adhesive strength and dimensional stability were reduced substantially. Accordingly, the adhesive strength and dimensional stability can be improved by the combination of Catalyst A, B, C or D and Catalyst E, F or G in the present invention.



When HFC-365mfc was used as a blowing agent:

Catalyst	Data	Flowability (cm)	Adhesive strength (kgf/cm <sup>2</sup> )	Dimensional stability (%)
Combination of Catalyst A and at least one of Catalysts E to G (Present Inv.)	Examples 13 to 15	78 to 80	1.26 to 1.48	-1.2 to -0.9
Catalyst A alone	Comparative Example 8	75	1.62	-8.2
Catalyst E alone	Comparative Example 12	72	0.67	-2.7
Catalyst F alone	Comparative Example 13	75	0.76	-4.3
Catalyst G alone	Comparative Example 14	76	0.72	-4.4

Catalyst	Data	Flowability (cm)	Adhesive strength (kgf/cm <sup>2</sup> )	Dimensional stability (%)
Combination of Catalyst B and at least one of Catalysts E to G (Present Inv.)	Examples 16 to 18	78 to 79	1.42 to 1.66	-1.1 to -0.7
Catalyst B alone	Comparative Example 9	75	1.75	-7.5
Catalyst E alone	Comparative Example 12	72	0.67	-2.7
Catalyst F alone	Comparative Example 13	75	0.76	-4.3
Catalyst G alone	Comparative Example 14	76	0.72	-4.4

Catalyst	Data	Flowability (cm)	Adhesive strength (kgf/cm <sup>2</sup> )	Dimensional stability (%)
Combination of Catalyst C and at least one of Catalysts E to G (Present Inv.)	Examples 19 to 21	78 to 80	1.30 to 1.52	-1.2 to -0.7
Catalyst C alone	Comparative Example 10	75	1.68	-7.8
Catalyst E alone	Comparative Example 12	72	0.67	-2.7
Catalyst F alone	Comparative Example 13	75	0.76	-4.3
Catalyst G alone	Comparative Example 14	76	0.72	-4.4

Catalyst	Data	Flowability (cm)	Adhesive strength (kgf/cm <sup>2</sup> )	Dimensional stability (%)
Combination of Catalyst D and at least one of Catalysts E to G (Present Inv.)	Examples 22 to 24	78 to 81	1.25 to 1.43	-1.4 to -0.8
Catalyst D alone	Comparative Example 11	76	1.55	-7.2
Catalyst E alone	Comparative Example 12	72	0.67	-2.7
Catalyst F alone	Comparative Example 13	75	0.76	-4.3
Catalyst G alone	Comparative Example 14	76	0.72	-4.4

As is evident from the above tables, where HFC-365mfc was used as a blowing agent, when Catalyst A, B, C or D was used alone, the dimensional stability was reduced substantially. Further, when Catalyst E, F or G was used alone, the adhesive strength and dimensional stability were reduced substantially. Accordingly, the adhesive strength and dimensional stability are improved by the combination of Catalyst A, B, C or D and Catalyst E, F or G in the present invention.